

United States Patent and Trademark Office

Application No.: 10/708,503
Confirmation No.: 2502
Customer No.: 51111
Docket No.: 21541-000310

Commissioner for Patents
POB 1450
Alexandria, VA 22313-1450

Declaration Under 37 C.F.R. § 1.132

Dear Commissioner:

1. My name is Li-Sheng Chen. I am an inventor of this utility patent application for “Traffic Management in Digital Signal Processor.”

2. I am the chief architect and chief executive officer of DinoChip, Incorporated. As the chief architect, I designed and implemented the industry’s only multiport sorting based traffic manager chip. Prior to working for DinoChip, I worked at Alcatel USA as a hardware design engineer. I worked on designing a traffic scheduler/shaper in an asynchronous transfer mode (ATM) switch to prioritize different Class of Service (CoS) packets. Overall, I have worked in the field of computer and data networking for more than ten years. I have applied for numerous patents of which six have been issued so far.

3. I have a Ph.D. in electrical engineering from Polytechnic Institute of NYU in Brooklyn, New York. The focus of my Ph.D. was packet scheduling, IP routers, ATM switches, traffic management (QoS), very-large-scale integration (VLSI) design, and the digital signal processing (DSP) chip. The title of my Ph.D. dissertation paper was “Architecture Design of Packet Scheduling for Delay Bound Guarantee.” Additionally, I have two master of science degrees: one in computer science and one in electrophysics. My bachelor of science degree is also in electrophysics.

4. This declaration is in support of the position that one skilled in the art of digital signal processing would understand how to make and use the recited invention from the disclosures coupled with the information known in the art without undue experimentation.

5. I have reviewed the entire application. I believe the application describes the invention in such terms that one skilled in the art can make or use the claimed invention without

undue experimentation. I believe the specification contains a written description of the invention in such terms as to enable any person skilled in the art to make and use the invention. I believe the specification supports my claims, and describes and reasonably conveys to one skilled in the relevant art, at the time the application was filed, that I had possession of the claimed invention.

6. Before my invention, one of ordinary skill in the art would not have considered it feasible to implement network traffic management using a DSP. One of ordinary skill in the art believed DSPs were designed for a wholly different purpose—generally for manipulating graphics, video, and audio. One of ordinary skill in the art would not have thought it was possible to process the high-bandwidth data traffic coming from network equipment using a DSP. Certainly, there was no known way to manage network traffic using a DSP.

7. My invention has broadened the scope of the uses of a DSP. My invention provides methods and techniques to enable one skilled in the art to implement a traffic manager using a DSP. For example, paragraphs 61–63 and figure 7 of my application teach how to implement traffic management functions in a single core DSP. The application describes what parts of the single core DSP will be implemented for policing, congestion control, scheduling, and shaping to achieve traffic management. Specifically, the application describes which on-chip registers or arithmetic logic unit (ALU) to the program the policing function. Then the application further describes how to program the conforming indicator to provide as an input to the second set ALU, which performs the congestion control. Then the application continues to provide instructions to implement scheduling and shaping functions. See application paragraph 62 and figure 7, and see also paragraph 64 and figure 8. Similarly, the application describes how to pipeline and parallel process a multicore DSP such that it can police, control congestion, schedule, and shape the network traffic. See application paragraph 64–69 and figures 8–12.

8. The application sufficiently describes and provides examples to implement a traffic manager using a DSP such that one skilled in the art could make or use the invention from the application coupled with the information known in the art without undue experimentation. To implement the technique and methods described, one skilled in the art would use his knowledge about traffic management tasks (policing, congestion control, scheduling, and shaping) and couple it with the DSP specifications and the teaching described in the application. Thus, the application provides sufficient direction and examples to enable one skilled in the art to use an old technology—a DSP—in a new way.

9. Furthermore, there was a long felt need to efficiently manage network in a cost effective manner. In the information age, computer networking is one of the most important technologies. Computer networks are instrumental for facilitating electronic commerce and internet traffic. Thus, there is a constant demand for continued development to improve network technology, especially since network traffic continues to rapidly grow.

10. Traditionally, traffic management was and still is implemented using semicustom integrated circuits such as application-specific integrated circuit (ASIC) chips and gate arrays or programmable integrated circuits such as field-programmable gate arrays (FPGAs). Before my invention, they had never been implemented using off-the-shelf DSPs.

11. Compared to DSPs, using a semicustom integrated circuit or programmable integrated circuit is expensive. A traffic manager implemented using a semicustom or programmable integrated circuit could cost hundreds or thousands of dollars. In comparison, the cost of using a DSP is much less at approximately \$7 to \$10 (or even less when purchased in quantity). Managing traffic using a DSP is a fraction of the cost of using a semicustom or programmable integrated circuit. Thus, there are great cost savings using a DSP over a semicustom or programmable integrated circuit.

12. Further, a traffic manager can also be implemented using a full custom integrated circuit, such as the MISD processor described in U.S. patent publication 2003/0152084 (Lee). However, designing a full custom integrated circuit involves specifying the chip, designing the chip, laying out the chip, making the masks for the chip, fabricating the chip, testing the chip, debugging the chip, and making revisions to the masks in the case that the chip does not function or operate properly. Needless to say, using a full custom integrated circuit to implement a traffic manager is substantially more costly than using a DSP.

13. My application describes some specific traffic manager implementations using DSP integrated circuits from, for example, Texas Instruments, Analog Devices, and Motorola. One of ordinary skill in the art recognizes that DSPs incorporate some features including an analog-to-digital converter, analog input, digital-to-analog converter, and phase-locked loop. When implementing a traffic manager using a DSP, such features of the DSP will also present. As one of skill in the art can appreciate, there is much less complexity and lower cost when using DSPs to perform network processing compared to designing a semicustom or full custom integrated circuit.

14. Additionally, a dedicated DSP-based traffic manager provides advantages over embodiments using a FPGA or ASIC chip, including lower power consumption, lower heat generation, lower cost, long instruction word, smaller package size, specific instruction set, and scalability of CoS register. For example, with respect to the long instruction word and specific instruction set, Texas Instruments TMS320C64xx requires one clock cycle to complete the NORM instruction on a 32-bit register. A FPGA or ASIC implementation may require more clock cycles to complete an equivalent operation. Lower power consumption by a DSP-based traffic manager may allow battery operation, and lower heat generation may result in less or no special cooling requirements in the network box. Thus, my invention satisfies a long felt need to manage network traffic in a cost effective manner without deteriorating the efficiency.

15. In summary, a person of ordinary skill in the art would immediately appreciate the real world value of my invention. The patent application teaches a method which reduces the cost of implementing a traffic manager by thousands of dollars, and teaches a new and practical application of an off-the-shelf DSP.

16. I declare that all statements made in this declaration of my own knowledge are true and all statements made on information and beliefs are believed to be true. I acknowledge that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under section 1001 of title 18 of the United States Code, and may jeopardize the validity of this application or any patent that issues from this application.

July 14, 2009

/Li-Sheng Chen/

Date

Li-Sheng Chen